IN THE DRAWINGS

The attached sheets of drawings include changes to Figs. 1, 2, 3, 4, 5 and 6. These sheets, which include Figs.1, 2, 3, 4, 5 and 6, replace the original sheets including Figs. 1, 2, 3, 4, 5 and 6.

Attachment: Replacement Sheets

REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-23 are pending in the application with Claims 1, 12, 13 and 17 amended by the present amendment. In the outstanding Office Action, the drawings were objected to; Claim 17 was objected to; Claims 1-6, 8, 9, 11, 12, 15-18, 20, 22 and 23 were rejected under 35 U.S.C. §102(b) as being anticipated by Nakamura (EP 0854620 A2); Claims 19 and 21 were rejected under 35 U.S.C. §103(a) as being unpatentable over Nakamura in view of Park et al.(U.S. Patent 6,470,030); Claims 13-14 were allowed; and Claims 7 and 10 were indicated as containing allowable subject matter.

Applicants acknowledge with appreciation the indication of allowable subject matter.

Applicants acknowledge with appreciation the personal interview between the Examiner, the Examiner's Supervisor and Applicants' representative on May 26, 2005. During the invention the claimed invention was compared with the disclosure of Nakamura. The Examiners acknowledged the circuit disclosed in Applicants' Figures 1 and 5-6 differ from the circuit disclosed in Figure 4 of Nakamura.

Figures 1, 3, 5 and 6 are amended to label the boxes shown therein. Figures 2-4 are labeled as "BACKGROUND ART". Support for these amendments is found in Applicants' originally filed specification. No new matter is added.

Claim 17 is amended to comply with 37 C.F.R. §1.75(c). Claim 1 is amended to recite a step of determining varying degrees of correlation within an interval and thereby detecting a subinterval within which a maximum degree of correlation occurs. Support for this amendment is found in Applicants' specification.[1] Claim 12 is amended to recite a step of calculating an error in current timing, comparing the calculated error with a predetermined

[1] Specification, page 11, line 15 – page 13, line 16.

threshold, and adjusting the timing of the synchronization pulse in response to the calculated error exceeding the predetermined threshold. Support for the amendment to Claim 12 is found in the specification.[2] Claim 13 is amended to recite a step of counting a number of symbol periods over which a current timing is determined to be an error and adjusting the timing of a synchronization pulse in response to the counter symbol periods exceeding a predetermined number greater than 1. Claim 15 is amended to recite a step of counting the number of symbol periods over which the current timing is determined to be in error, and 60 adjusting the timing of the synchronisation pulse in response to the counted symbol periods exceeding a predetermined number greater than one. Support for the amendment to Claims 13 and 15 is found in the specification.[3] No new matter is added.

By way of background, it is well known to correlate samples of a received signal which are separated by a period corresponding to the useful part of an OFDM signal.[4] By integrating the output of the correlator, it is possible to determine the symbol boundary, which occurs when the integrator output reaches a peak.[5] Using such a technique, however, means that the synchronization pulse will always be provided at the end of the correlation part of the guard interval (Ng).[6] Applicants' claimed invention relates to an improvement over the conventional art whereby the synchronization pulse is provided in the sub-interval of maximum correlation. Accordingly, with Applicants' claimed invention, the synchronization pulse will be provided within the interval 102 shown in Figure 4(e).

In contrast, Nakamura is an example of the conventional art, except that the correlator operates in only part of the guard period (so as to reduce complexity and increase speed). However, the correlator output of Nakamura is integrated in the same way as the previously described conventional art, resulting in the synchronization pulse always being issued at a

[2] Specification, page 14, line 22 – page 16, line 20.
[3] Specification, page 16, line 20 – page 18, line 4.
[4] Specification, Figure 2.
[5] Specification, Figure 2(c).
[6] Specification, Figures 4(e)-4(f).

point corresponding to the end of the correlated part of the guard interval, regardless of varying levels of correlation associated with multi-path operations. Thus, in Figure 6(f) of Nakamura, the synchronization signal will always be provided at the peak of the triangular waveform, which is always at the end of the correlation period shown in Figure 6(e).

Nakamura also describe the use of a threshold TH (Figure 6(f)), but this threshold is used only to avoid the effects of noise and does not influence the time at which the synchronization pulse is provided.

Turning now to the claims, briefly recapitulating, Claim 1 is directed to a method of generating a synchronization pulse representing a symbol boundary in an OFDM signal. The method includes providing a signal representing a degree of correlation between samples of a receive signal which are separated by a period corresponding to a useful part of the symbol. The signal thus provides an output representing for each symbol an interval during which significant correlation is found. The method further includes a step of determining varying degrees of correlation within the interval and thereby detecting a subinterval within which a maximum degree of correlation occurs. The method also includes arranging for the synchronization pulse to be provided within this subinterval. Applicants' claimed invention provides for improved multipath interference suppression.[7]

Nakamura describes generating a synchronization signal based on converting an OFDM modulated signal into an analog signal. In particular, Nakamura describes the use of threshold as shown in Figure 6F for synchronization. However the threshold of Nakamura has no relationship with timing error. The threshold of Nakamura is an amplitude threshold which is set so as to remove noise.[8] The amplitude of the waveform in Figure 6F and, thus, the threshold of Nakamura has no relationship with errors and/or synchronization pulse timing.

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[7] Specification, page 12, lines 3-8, page 18, lines 7-15.
[8] Nakamura, column 9, line 52 – column 10, line 2.

Amended Claim 12 is directed to a method of generating a synchronization pulse representing a signal boundary in an OFDM signal. The method includes, *inter alia*, a step of calculating an error in current timing, comparing the calculated error with a predetermined threshold, and adjusting the timing of the synchronization pulse in response to the calculated error exceeding a predetermined threshold. However, as with Claim 1, Nakamura fails to disclose or suggest Applicants' claimed steps of error calculation comparison and adjusting. Again the threshold shown in Figure 6F of Nakamura is an amplitude threshold which has no relationship with errors and/or synchronization pulse timing.

Amended Claim 15 is directed to a method of generating a synchronization pulse representing a symbol boundary in an OFDM signal. The method includes the step of adjusting a timing of a synchronization pulse in predetermined quantities corresponding to a plurality of sample periods. As noted in Applicants' specification, in the preferred embodiment, the timing is altered by an amount corresponding to $(n_{max}-n_{min})/4$.[9] In other words, with Applicants' claimed invention any alteration of timing assuredly corresponds to a plurality of sample periods.

Nakamura discloses an averaging circuit that uses a time synchronization signal by averaging the timings of the synchronization of signals of multiple respective symbols (e.g., 76 symbols).[10] Applicants submit that the Office Action misapprehends Nakamura by confusing the well known "sample period" (which means a small part of an OFDM signal) to cover an averaging period corresponding to multiple symbols. Nakamura does not disclose or suggest Applicants' claimed averaging the timings of the synchronization of signals of multiple respective symbols. Claim 15 refers to the fact that the quantity of the adjusting of a timing includes a plurality of sample periods. In contrast, Nakamura does not refer to any limitation on the quantity by which the timing is adjusted.

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[9] Specification, page 14, lines 13-18.
[10] Nakamura, column 10, lines 6-26.

Claim 20 is directed to a method of receiving an OFDM signal. The method includes generating a synchronization pulse and using the synchronization pulse in order to apply FFT to complex samples derived from the OFDM signal. The method also includes providing, when the timing of a synchronization pulse is altered, a signal representing a degree of alteration, and applying phase rotation to the transformed samples. In other words, the transformed samples are the samples which have been transformed using the FFT circuit. Thus, as shown in Applicants' figures, the output of FFT 14 is delivered to a phase rotator 15 which receives a signal from a symbol synchronization circuit 20.

Nakamura describes applying a time synchronization signal to a phase discriminating/frequency synchronization signal generating circuit 51. The purpose of this circuit 51 is to obtain correct frequency synchronization at the front end of the receiver for demodulation purposes. However, there is no reference in Nakamura to phase rotation of transformed samples which appear at the output of FFT circuit 35.

MPEP § 2131 notes that "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art." *Brown v. 3M*, 265 F.3d 1349, 1351, 60 USPQ2d 1375, 1376 (Fed. Cir. 2001) (claim to a system for setting a computer clock to an offset time to address the Year 2000 (Y2K) problem, applicable to records with year date data in "at least one of two-digit, three-digit, or four-digit" representations, was held anticipated by a system that offsets year dates in only two-digit formats). See also MPEP § 2131.02. "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236,

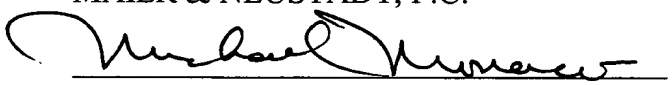
9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Because Nakamura does not disclose or suggest all the features recited in Claims 1, 12, 13, 15 and 20, Nakamura does not anticipate the invention recited in Claims 1, 12, 13, 15 and 20, and all claims depending therefrom.

Applicants have also considered the Park reference, and Park does not cure the deficiencies of Nakamura. That is, there is no disclosure in Park of a phase rotator which rotates the transformed samples from an FFT. Furthermore, contrary to the Official Action, there is no reference in Park to a look-up table addressed in accordance with a signal representative degree of alteration of a synchronization pulse timing. As none of the cited prior art, individually or in combination, disclose or suggest all the elements of independent Claims 1, 12, 13, 15 and 20, Applicants submit the inventions defined by Claims 1, 12, 13, 15 and 20, and all claims depending therefrom, are not rendered obvious by the asserted references for at least the reasons stated above.[11]

Accordingly, in view of the present amendment and in light of the previous discussion, Applicants respectfully submit that the present application is in condition for allowance and respectfully request an early and favorable action to that effect.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



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[11] MPEP § 2142 "...the prior art reference (or references when combined) must teach or suggest **all** the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)."